

HIGH CAPACITY AND HIGH RATE BATTERIES

Abstract of the Disclosure

Improved batteries described herein generally comprise an electrolyte having lithium
5 ions and a cathode comprising submicron metal vanadium oxide particles. In some
embodiments, the battery demonstrate an accessible current capacity of at least about 220
mAh/g when pulsed in groups of four constant energy pulses at a current density of 30 mA/cm^2
to deliver 50 Joules per pulse. The four pulses of a pulse train are separated by 15 seconds of
rest between each pulse, and there are 6 days between pulse groups, upon discharge down to a
10 pulse discharge voltage of 2 V. In further embodiments, the batteries have an average internal
electrical resistance of no more than 0.2 Ohms at a current density of at least about 30 mA/cm^2 .
Furthermore, the batteries can have a current capability of at least about 0.4 amps per cubic
centimeter battery volume. Due to the improved discharge performance, the batteries can
exhibit no significant voltage delay throughout the life of the battery as demonstrated in a three
15 month accelerated discharge test.